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(54) Biocidal material

(57) The invention relates to plastics, rubber and textile materials including an agent which renders the materials biocidal, i.e. antiseptic or disinfectant.

A mixture of 5% by weight Chlorhexidine and 95% polypropylene has been found when moulded to provide a plastics material which effectively kills bacteria whilst retaining desirable properties of manufacture.

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SPECIFICATION

Biocidal material

Technical Field of the Invention

The invention relates to synthetic high polymeric materials such as plastics, fibres and fabrics having a bacteriocidal, antiseptic or disinfectant effect.

Background Art

Many articles are today made of plastics material as it is relatively inexpensive, but is light in weight, relatively easily manufactured by a variety of processes to numerous shapes, and can be relatively easily coloured to a desired colour by addition of suitable additives. Because of its relatively ubiquitous nature, plastics materials when made are often contacted by a number of different people, with the result that potentially harmful bacteria on the plastics can be communicated from one to another. This is a disadvantage of plastics and rubber materials and textile and similarly related materials.

Disclosure of the Invention

It is an object of the invention to seek to mitigate this disadvantage of prior plastics, rubbers and related materials.

According to one aspect of the invention there is provided a material which is biocidal, comprising:

(i) a material,

(ii) a biocidal agent,

(iii) the material and biocidal agent being combined in proportions to render the material biocidal.

Thus using the invention it is possible to provide a plastics or rubber material in bulk or fibrous form which have inherently antiseptic or disinfectant or bacteriocidal properties.

The plastics or related materials may be moulded to a required shape. This provides an article which is antiseptic or disinfectant or bacteriocidal.

The material may be formed by method common in the art such as injection moulding, blow moulding, casting, sintering, dip coating whilst fibres may be manufactured either by wet or dry spinning or extrusion net-forming. Each process provides a relatively simple manufacturing method.

The agent used for rendering the material bacteriocidal antiseptic or disinfectant may be a biguanide, for example, 1,6-di(-4-chlorophenyl diguanido)hexane (Chlorhexidine) which provides a particularly effective agent which is not harmful to the touch, and which is easily provided in particulate form.

The material may be a plastics material such as polypropylene. This is a relatively easily moulded material.

There may be a plastics material which comprises 95% by weight polypropylene and 5% by weight chlorhexidine.

Alternatively the material may be a thermoset, or a natural or synthetic rubber. The plastics or rubber could be liquid in its uncured form.

According to a second aspect of the invention there is provided a method of making a material which has biocidal properties, comprising: (i) providing particulate material; (ii) providing particulate biocidal agent which will render the material biocidal; and (iii) mixing the particles in a desired proportion.

According to a third aspect of the invention there is provided a method of making a biocidal material which has antiseptic or disinfectant properties, comprising the steps of providing a liquid plastics or rubber material providing a liquid or particulate agent and causing the mixture to form a hard or soft solid having antiseptic or disinfectant or bacteriocidal properties.

The invention is hereinafter described in the following Examples.

EXAMPLE I

5% by weight of particulate antiseptic agent in the form of Chlorhexidine crystals were mixed with 95% by weight polypropylene particles. The crystals and particles were mixed and then moulded by an injection process to provide a coherent plastics material.

A disc was cut from this material and was coated with flora from the human gut. The disc was incubated and then the flora counted. There were none on the disc. The Chlorhexidine had effectively killed the bacteria on the surface of the plastics, which maintained its usual properties of lightness and ability to be formed, while the Chlorhexidine maintained its antiseptic characteristics.

EXAMPLE II

5% blood agar plates were inoculated separately with *S. aureus, E. coli, Ps. aeruginosa* and polypropylene discs containing 5% by weight of Chlorhexidine were placed on the surfaces. The plates were incubated at 37°C for 24 hours and extensive zones of inhibition were observed around the discs. Subcultures of agar around and beneath the discs were incubated on 5% blood agar plates for 24 hours at 37°C and no growth was observed. The Chlorhexidine had effectively killed the bacteria.

To simulate the long term bacteriocidal activity of Chlorhexidine, samples of polypropylene containing 5% biocide were held for long periods at 50 and 100°C and then submitted to the above bacteria protocol. No significant reduction in activity was observed.

EXAMPLE III

1% by weight of particulate antiseptic agent in the form of chlorocresol crystals were mixed with 99% by weight polypropylene particles. The crystals and particles were mixed and then moulded by a spinning process to provide a coherent plastics material.

A disc was cut from this material and was coated with flora from the human gut. The disc

was incubated and then the flora counted. There was none on the disc. The chlorocresol had effectively killed the bacteria on the surface of the plastics, which maintained its usual properties of lightness and ability to be formed, while the chlorocresol maintained it antiseptic characteristics.

It will be understood that any desired proportions of plastics to biocide (antiseptic/disinfectant agent) can be used. Also, any desired thermoplastic, thermoset or rubber which can be formed to a desired shape may be used.

The plastics or rubber and agent provide an integral antiseptic/disinfectant material, which can be moulded to provide lavatory seats and/or covers, flushing mechanisms including handles, door knobs, work-surfaces, trays, mattress and pillow covers, mats, liquid and air filters, rigid or elastic artifacts and the like. It will be understood that the invention extends to such articles.

The bacteriocidal, antiseptic or disinfectant agent may also be a liquid prior to setting.

CLAIMS

1. A material which is biocidal, comprising: a material; a biocidal agent; and the material and biocidal agent being combined in proportions to render the material biocidal.

2. A material according to Claim 1, which material is moulded to a desired shape.

3. A material according to Claim 1 or Claim 2, which material is formed by a spinning process.

4. A material according to Claim 1 or Claim 2, which material is a plastics material moulded by an injection moulding process.

5. A material according to any preceding Claim, in which the biocidal agent comprises Chlorhexidine.

6. A material according to any preceding Claim, in which the material is a plastics material comprising polypropylene.

7. A material according to any of Claims 1 to 4, in which the plastics material is polypropylene, the biocidal agent is Chlorhexidine, and in which the polypropylene and Chlorhexidine are in the proportion 95%:5% by weight.

8. A material according to Claim 1 or Claim 2, the material being a rubber.

9. An article made from a material according to any preceding Claims.

10. A method of making a material which has biocidal properties comprising the steps of providing particulate material, providing particulate biocidal agent which will render the material biocidal, and mixing the particles in a desired proportion.

11. A method of making a material which has biocidal properties, comprising the steps of providing a liquid material, providing biocidal agent which will render the material biocidal, and forming a solid material which is biocidal from the liquid material and the biocidal agent.

12. A material according to Claim 1, which is biocidal, substantially as hereinbefore described.

13. A material according to Claim 1 which is biocidal, substantially as hereinbefore described with reference to and as described in any one of the Examples.

14. A method of making a material which has biocidal properties, substantially as hereinbefore described.

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